Response to FCC Request For Comment – CG Docket No. 09-158

Pertaining to the establishment of regulatory measures to limit consumer 'Bill Shock'.

> *In this public notice we seek to gather information on the feasibility of instituting usage alerts and cut-off mechanisms similar to those required under the EU regulations that would provide wireless voice, text, and data consumers in the United States a way to monitor, on a real-time basis, their usage of a wireless communications service, as well as the various charges they may incur in connection with such usage (e.g., roaming services, voice service "minute plans," text message plans).*
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> *Specifically, we seek comment on whether technological or other differences exist that would prevent wireless providers in this country from employing similar usage controls as those now required by the EU.*

Bridgewater Systems has been producing software solutions for telecommunications companies for over 13 years. Our pedigree is in mobile data policy control and subscriber data management, which encompasses consumer admission control (AAA – authentication, authorization and accounting) function as well as dynamic policy control of consumer data services. Our Policy Controller and MyPolicy product lines provide an excellent technical solution to the Bill Shock problem, and Policy Controller is deployed today with a global mobile operator property in the EU specifically to address the legislative requirements around mobile data bill roaming bill shock

Bridgewater Synopsis - Based on research with EU and North American operators over the past year, Bridgewater believes that the North American market and the European market have many of the same bill shock prevention tools available to them, and that the introduction of these tools is technically feasible with solutions that are available on the market today . There are a few subtle distinctions between these markets – such as plan type, existing charging systems– that come into play but broadly speaking, the technology tools exist today that can be deployed in either market.

Key Findings from Research with EU Operators

Over the past year, Bridgewater has been reaching out to wireless data operators in North America and Europe for the purpose of gathering market intelligence around bill shock – specifically to understand how our policy control products can best meet market demands for customer transparency around mobile data usage and bill shock prevention methods. The research objective was to understand what solutions were currently in place, what kinds of technology were being used, and (in the case of European operators) what approach was being taken to deploy or adapt this technology in order to meet bill shock legislation. We uncovered one major technical difference between European and North American operators, particularly among the smaller carriers: where most European operators offer prepaid voice and data services based on usage tariffs (i.e. $ per MB), most of their North American counterparts have embraced fixed-rate, 'all you can eat' plans – so they have not deployed real-time usage collection capabilities. It is worth noting that operators are beginning to transition to tiered services – with specific volume limits, and overage charges thereafter.

The EU legislation, which came into effect in March 2010, was focused primarily around limiting the consumer exposure to high costs and resulting mobile bill shock associated with using data services while roaming between EU countries.   In many instances, operator business models accounted for, and indeed relied upon, the revenues that were associated with the delivery of data services in roaming scenarios.   The legislation (ratified in April 2009) imposed firm deadlines for the deployment of a service, including a phase 1 deployment date of March 1st, 2010. Penalties associated with non-compliance were left to each country to define and implement.

In the period from July 2009 – December 2009, Bridgewater Systems reached out to a number of mobile operators in the EU concerning the bill shock legislation and potential solutions. Some of the major findings uncovered were:

1. Most EU operators were unhappy about being forced down a path within such a short time frame.   Although there had been plenty of warning from the legislative body, the fact that the legislation was ratified in April 2009 – partway through the 2009 fiscal year – forced operators to deploy a solution outside of the normal funding cycle. This resulted in many operators taking shortcuts to get a suboptimal solution in place purely to meet the legislative deadline.

2. While some operators viewed the legislation as an inconvenience – or, in the cases of some of eastern European and Baltic operators, as a significant cause for loss of revenue – most operators saw the value in providing consumers with a more transparent view of usage and spend.

3. Although the EU legislation principally targeted data roaming scenarios, many operators expressed the desire to embrace a "phase II" for transparency, extending the functionality to domestic use as well as international roaming.

4. For most operators, the efficient enforcement of the legislation became a monumental task – not so much from a technical perspective, but from a logistical one.   Developing an approach which would rate usage based on all existing data plans, inclusive of not just current plans but also all grandfathered plans which offered mobile data services, proved to be a significant challenge.   Rather than dealing with just the current data plans – typically numbering between 2 and 20 per operator – some operators were looking at over 600 plans. Technology notwithstanding, a task of this complexity is not a simple feat to accomplish – especially under the short timelines.

5. The legislation did not clearly address situations where operators offer bundled services – for example, a mobile data plan which provides 1GB usage per month with 100MB international data roaming included.   It was difficult for many European operators to reconcile whether the roaming spend should be inclusive of the 'free' usage bundled into the package – whereby a portion of the monthly subscription package would be included in the €50 monthly cap – or whether this should be excluded – whereby the counter for mobile data roaming cap only

started after the bundled data roaming allowance had been exhausted.   This was also an issue with corporate and organizational mobile data plans.

6. There were two common technology approaches to solving this problem – extend the network capability or extend the billing system capability.

Approaches to Solving the Problem

There were two common approaches to solving this problem – extend the network capability or extend the billing system capability.   Extending the network capability involved the addition of real-time metering and policy control products into mobile networks.   In the case of GSM/HSPA operators (the vast majority in Europe), this would entail the addition of a Policy and Charging Rules Function (PCRF) to their network control plane, and an upgrade to their GPRS Gateway Serving Nodes (GGSNs) to support the PCRF functionality.   This approach was most often adopted by operators who either had the requisite GGSN functionality deployed, or had budgeted plans in 2009 to do so, with the EU legislation providing another use case to support as part of what was already planned in terms of network upgrades.

A common short term approach to the EU legislation was to extend pre-existing online charging systems to provide the most basic solution to the problem.   Most European operators have a large prepaid consumer base – in many cases consisting of more than half of their subscribers.   In order to manage prepaid voice and data services, these operators use online charging systems to track consumer usage. In a prepaid environment, it is standard process to simply terminate the voice call or data session when the prepaid funds run out.   And this is what operators did, after sending the prerequisite notification when the consumer's data roaming spend reached €40.

In North America, prepaid data services are far less prevalent than in Europe.   Many smaller rural carriers do not offer prepaid data services at all, as doing so often includes a costly and time-consuming upgrade to existing voice online charging systems.   This presents a challenge that was largely nonexistent in Europe: one of the most widely adopted options for dealing with bill shock is simply not available in the small to mid-sized US operators.

The Adoption of Tiered Services

Another trend in the mobile data industry will serve to exacerbate the current bill shock problem: the general move away from 'all you can eat' services to tiered services.

The broad adoption of tiered services in the North American mobile data market has been a long time coming.   In the early days, when the principle focus of operators was customer acquisition, the development of all you can eat data plans made good sense.   With the relatively slow technology found in early 1xRTT and GPRS systems, 'all you can eat' could be expressed as a reasonable amount of data consumption, primarily constrained by the speed at which the consumer could access the data services. And there was another benefit to the all-you-can-eat service: operators did not need to worry about

monitoring customer usage *at all*. There was no impact to billing systems or other customer-facing aspects of the operator business.

With the advent of high speed broadband data networks, and the widespread adoption of big screen mobile devices such as wireless-enabled laptops, netbooks and the newly released Apple iPad, the challenge to the mobile operator has shifted from one of customer acquisition to one of meeting the consumer's collectively increasing appetite for data services.   As one large US carrier learned from their iPhone launch, wild success in the sales and marketing of these services will result in broad failure if the network cannot keep up with consumer demand.   This leaves the operator with two choices: begin to regulate consumer usage or invest significantly in network capacity.

Investing in network capacity is a costly and short-term solution to the mobile data problem.   Recent history has shown that applications and services will be developed to take advantage of network capacity as fast as (indeed, faster than) the network operator can build that capacity out.   And the operator has the additional challenge of *paying* for the network build out. Unless they can pass the costs on to the consumer – an approach that would be met with consumer resistance and undermined by competitive pressures – the operator is faced with ever-diminishing returns on their network investment.

Tiered services offer a good compromise for the North American wireless data market.   However, the secret to a successful tiered service plan is the adoption of technologies which allow the operator to handle the consumer experience when their allotment of data services has been exhausted.

Some tiered service plans today open the doors to bill shock scenarios by charging for over-usage on a tariff basis (i.e. $ per Megabyte). Even coupled with notifications – warnings sent to the user when they consume 75%, 90% and 100% of their monthly data allowance – the possibility for an unattended device to rapidly consume significant data resources at significant cost is very real. A better approach to charging for data usage would be to cut off data services: a heavy-handed but effective solution to bill shock. But this sacrifices customer quality of experience for customer protection.

So what other options are available today?

Looking back at the conditions under which operators felt comfortable delivering all-you-can-eat services, it can be seen that the technical limitation of speed provided a natural barrier to the rampant overuse of data services. If operators can provide tiered services which *slow down* the rate at which users consume data services when their monthly cap is exceeded, they can provide both a superior quality of experience to the consumer and a solution to the bill shock problem.

The capability to slow down the user connection lies entirely in the adoption of network control capabilities such as those defined by the PCRF in the 3GPP (HSPA and LTE) standards.   The PCRF provides a control point to the network which handles the dynamic allocation of resources to the consumer data connection – it holds the network intelligence which determines the connection rate at which a data session should be established, and the rules that identify the conditions under which the connection rate should be modified. The PCRF (or more generically, the Policy Decision function or PDF)

controls the network elements that host the data session in the network (the PDSN/HA in CDMA networks, the GGSN in GPRS, EDGE and HSPA networks, the PDN-Gateway in LTE networks and the ASN Gateway in WiMAX networks). Most of these network elements have the ability to enforce different connection rates and can be used to downspeed user connections today. However, not all of today's network elements provide standards-based communication vectors for the interaction between PDF and the element itself.

In the CDMA, 1xRTT and EVDO networks that are more commonly found in North America, the standards around the adoption of policy decision function have fallen somewhat to the wayside. Although the 3GPP2 standards defined interfaces that perform policy control functions similar to those found in 3GPP networks, these standards have not been broadly adopted, with the result that North American operators do not currently have network equipment which support these standard interfaces. However, a common control protocol called RADIUS can be used to provide the near real-time usage tracking and network control required to enforce bill shock standards. RADIUS solutions which govern which devices can connect to the mobile data networks are a fundamental part of the CDMA network control plane, and are found in all CDMA-based mobile networks.

In summary, the challenges that face U.S. network operators in meeting the bill shock problem are going to be similar to those faced by the EU operators, but there are technical limitations in North American networks, most notably the lack of ubiquitous data online charging systems, which are going to sway the industry towards a more network-focused solution. Most operators will have the basis for such a solution in their networks today, but the introduction of policy control products to manage the existing network elements is not going to be an insignificant task.

> *Comments on the extent to which consumers currently have the means at their disposal to monitor their wireless data usage and are fully aware of the consequences of exceeding their predetermined allocations of voice minutes, text message limits or data usage.*
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> *To what extent are U.S. providers already offering such features, and at what cost to the consumer and/or to the provider?*

Bridgewater Synopsis - Many US operators are offering numerous data usage transparency tools today that allow consumers to monitor wireless data usage including online portals, email and SMS notifications about impending limits and usage thresholds. However, some of these are hampered by a lack of real-time capability which results in usage being many hours out of date, enough of a lag to still result in bill shock for the consumer. Compounding this issue is the fact that accessing an online portal from a mobile device is not always practical and easy to accomplish: the simple necessity of entering login credentials to these portals from mobile devices is a deterrent to many subscribers. Deploying a real-time policy control capability which can provide a current view of data usage, together with a client solution that provides convenient immediate access to data usage is an ideal solution.

Online Portals

Today, many of the larger US operators offer access to online portals which display usage information to their customers. Unfortunately, these portals more often than not display old data – usage statistics that are as much as 24 hours out of date. In today's high speed networks, the lack of accurate real-time usage information is a serious impediment to providing cost transparency to the consumer. Other strategies like real-time advice of charge are available, but not widely used in today's data networks.

Although it is common practice internationally to provide consumers with access to a portal page free of charge which shows their usage, these portal pages are often updated on a periodic – every 12-18 hours – basis and do not offer a real-time view of usage.   In the low-speed wireless networks of the past, this was probably sufficient.   The amount of data that a customer could use in a 4 hour period was unlikely to result in serious overage charges when on-net.   However, as network speeds have increased, the need for a more accurate, real-time view of network usage arises.

Many small operators in the U.S. do not currently provide a view on usage to the consumer, nor do they have the means at their disposal to notify consumers when they reach a limit or cross a usage threshold. The most obvious reason for this is the widespread adoption of 'all-you-can-eat' plans and the simplicity of managing such plans.   With 'all you can eat', the operator does not have a need or requirement to notify a user concerning their usage in a real-time manner, as there is generally not a clear usage threshold defined.   Enforcement of *fair-usage* clauses is typically done through the post-processing of usage records at the end of the billing cycle.   Operators single out the top data users, determine whether any of the usage is excessive, and handle these users on a case-by-case basis.

Notifications

Many means to communicate with the consumer for notifications exist today including SMS, email, embedded device-based notification (such as the Android NotificationManager and the Apple Push Notification Service introduced in iPhone 3.0), web redirection and client application based notification. However, each of these notification systems comes with inherent strengths and weaknesses:

> **SMS notifications** are generally delivered in real-time, though real-time delivery is not guaranteed. It is delivered over the voice network service, and as such all smart phones on the market today are capable of sending and receiving SMS messages – but many data-only devices such as wireless network dongles are not.

> **Email notification** is a reliable mechanism for sending information to a consumer, provided that the operator has access to a valid email address for that consumer.   The principle drawback to using email as a notification mechanism lies in the non-real-time nature that users actually *access* email.   If the user checks their email on a daily basis, a real-time notification of charge sent at 9am is not useful when the user checks their mail at 10pm.

> **Device-based notification** offers consumer notification in real-time using the built-in presence and communication capabilities of the device. The obvious drawback to this, of course, is the fact that these solutions are device-dependent. Operator networks are rarely homogeneous from a consumer handset perspective.

Web redirection is the method by which a customer's HTTP traffic is redirected to a temporary location – a portal page, for example – where the notification message is prominently displayed. Web redirection is generally most effective on big screen devices such as netbooks and laptops, but as with email, is largely dependent on the customer accessing the web browser to deliver the message. This approach is typically most effective when coupled with an enforcement mechanism such as service blocking or downspeeding.

Client application notification is a solution where the consumer uses a custom application on their device which handles the tracking and notification of usage.

Each of the mechanisms listed above have inherent strengths and weaknesses, often largely dependent on the type of device that the consumer is using and the way that the consumer is using the device. In order to maximize the ability to efficiently communicate with the consumer, operators should be able to provide the consumer with the choice of how they want to be notified.

Frequency of Notifications

Another aspect of notification is the frequency and thresholds at which the consumer is notified. Although the EU legislation nominated a €50 spend limit as the default point at which an operator is to limit the consumer exposure to roaming charges, this number is somewhat arbitrary. The 'one size fits all' approach doesn't – fit all, that is. A far better approach is to provide the consumer with the ability to set their own spend limits and thresholds, set their own warning levels and basically manage their exposure to meet their individual needs.

Real-time advice of charge

A common solution to billing related issues in the voice network is called *Real-time Advice of Charge*. In some voice networks, the operator is required to inform the user when they are about to commence an activity which may result in charges. For example, when dialing a North American 800 number from an international line, a voice message is injected into the call informing the customer that the call to the toll-free service can be connected as dialed, but that standard international long distance rates apply.

This is called real-time advice of charge. The message is injected into the call flow early in the session before the call is established, and the customer has the time to terminate the call before chargeable activity commences.

Real-time advice of charge can be achieved in mobile data devices through a combination of web redirection and SMS (or application-based) notification. Web redirection can promote a data experience that is similar to the Wi-Fi hotspot experience: when a new session is established, all data services are blocked with the exception of web browsing. Opening any web page will redirect the user to an advice of charge page which informs the consumer that their data connection will be subject to charges in addition to the basic service fee.

By rounding this solution out with an SMS message, the operator can notify the user that they have been redirected to a web page, and provide instructions on how to accept the charges and commence their data session.

Voice versus Data Usage Controls

Not all usage controls are created equal – and different controls are required to manage data session than those that control voice usage.

From a user perspective, the fundamental difference between voice and data usage is the manner in which the consumer is charged for these services. Voice services – at least the ones that attract a usage tariff (e.g. long distance call) – are typically charged by the time that the connection is maintained. In other words, consumers can gauge how much they will be charged for a voice call based on how long they talk on the phone.

Data is typically billed by the aggregate volume of information that is transferred to or from the consumer device. Some of this data is the result of direct consumer interaction – web browsing, instant messaging, etc. – but much of the data used by the typical consumer is invisible to the consumer. "Invisible" usage includes control things like the signaling that is required to maintain an IP data connection, the delivery of application updates, the frequent presence updates that are used to maintain buddy lists and IM connections.

Similarly, usage controls need to take into account the way that the usage is generated and the consumer's perception of how the device is being used. Data services are managed by volume, and usage should be controlled in a similar fashion.

In some cases, usage controls for voice connections can simply be addressed by mandating that the service provide be clear in all aspects of how a call is charged. Many hotels in Europe advertise low cost long distance charges for international calls – 'as low as <major operator>'s preferred international rates'. What they do not clearly state up front is that the service comes with an €18.90 connection fee. This kind of omission of data is clearly misleading and should be actively discouraged if bill shock scenarios are to be avoided.

Accessibility for people with Disabilities

Policy Control products, such at the Bridgewater Policy Controller, offer the ability for extending the notification frameworks to integrate new systems and protocols to facilitate the communications with consumers. These solutions can be easily extended to integrate with specialized systems to facilitate the communication with consumers with disabilities.

Policy Control products can also be made aware of the type of disability that a consumer has (as stored in the subscriber database), and can make intelligent decisions around the delivery of service and notifications based on this data. The integration of voice dialing solutions for notification is a good example. If the Policy Control solution knows that a customer is visually impaired, it can send a usage threshold notification with a distinct modality such as a different ringtone.

The most challenging aspect of providing a means to support people with disabilities may lie in providing these people with the ability to set and manage their own thresholds. This will be the same issue that people with disabilities would have in using the mobile devices today – and likely will be addressed by the same technologies that are being developed to address general usability.

Conclusion

North American operators have at their disposal a number of tools which can be used to implement effective solutions to prevent consumer bill shock in the mobile consumer marketplace. What is commonly lacking is the ability to track consumer usage in real-time and the capability to use centralized business intelligence to optimize timely communication with the consumer. Most mobile operators are actively looking to deploy tools that address these needs in their networks in the short to medium term – the kind of controls that are needed to manage the customer experience from a bill shock perspective also provide the operator with an powerful array of tools which enable new business models and a broader range of services that better meet consumer needs.

The North American mobile data industry is entering a new phase which promises to herald the demise of the 'All You Can Eat' data plan. The operators have the tools to intelligently manage and control the consumer experience to minimize bill shock – and competitive pressure will force them to use these tools. Real time usage collection and proactive notification techniques, coupled with the ability to manage the customer experience when usage caps are reached, will become a necessary function in the data networks of the future. The alignment between consumer protection, business goals and market developments means the time is now right to implement these technologies in mobile networks.

About Bridgewater Systems

Bridgewater Systems, the mobile personalization company, enables service providers to efficiently manage and profit from mobile data services, content and commerce. The company's market leading mobile personalization portfolio provides a real-time, unified view of subscribers including entitlements, devices, networks, billing profiles, preferences and context. Anchored by Bridgewater's Subscriber Data Broker™, the portfolio of carrier-grade and standards-based products includes the Bridgewater® Service Controller (AAA), the Bridgewater® Policy Controller (PCRF) and the Bridgewater® Home Subscriber Server (HSS). More than 140 leading service providers including America Movil, Bell Canada, Clearwire, Cox, Hutchison Telecom, Iusacell, Scartel, SmarTone-Vodafone, Sprint, Tata Teleservices, Tatung, Telmex, Telstra, and Verizon Wireless use Bridgewater's solutions to rapidly deliver innovative mobile services to over 150 million subscribers. For more information, visit us at www.bridgewatersystems.com.

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